

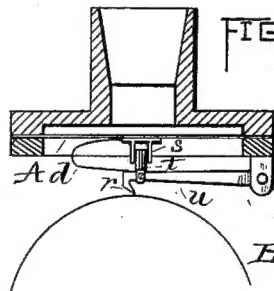
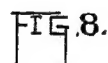
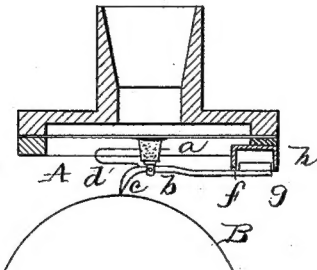
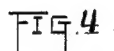
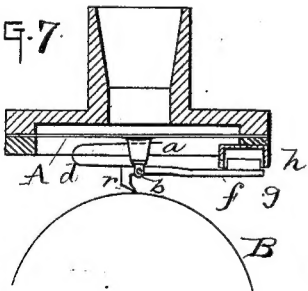
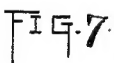
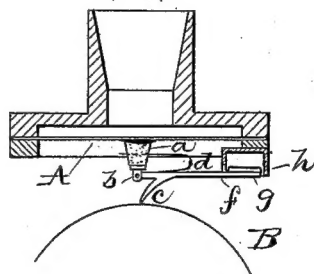
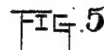
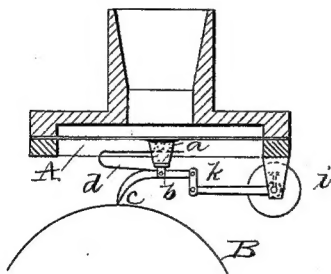
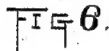
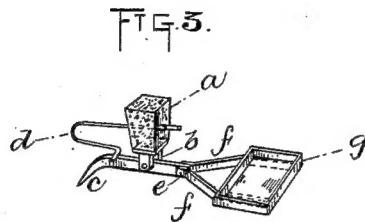
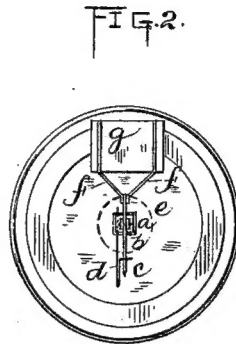
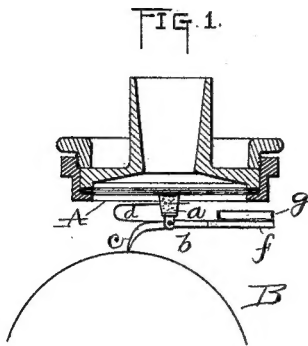
(No Model.)

T. A. EDISON.

PHONOGRAPH RECORDER AND REPRODUCER.

No. 397,280.

Patented Feb. 5, 1889.



Witnesses:
E. C. Rowland.
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By his Attorneys *John Lacey*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH RECORDER AND REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 397,280, dated February 5, 1889.

Application filed September 27, 1888. Serial No. 286,552. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 804,) of which the following is a specification.

My invention relates to the recording and reproducing devices of the phonograph; and my object is to enable such devices to work independently of irregularities in the surface of the phonogram. Sometimes in the manufacture of phonogram-cylinders irregularities or eccentricities occur in the formation of the surface, and sometimes the cylinders become warped after manufacture, and if provision is not made to prevent it such irregularities will occasion oscillations of the reproducing-point and the diaphragm, which will interfere with the recording or reproducing of the sound. This is obviated by my invention, which consists, mainly, in so supporting the recording or the reproducing point that it is capable of movement independently of the diaphragm, but that such independent movement is retarded so that it does not occur with the rapid and minute vibrations of the sound-record, but only with the slower and more extensive vibrations which are produced by irregularities in the shape of the phonogram. The sound-vibrations have to-and-fro movements of great rapidity and large number per second, and these cannot move the retarding device, so that the same acts as though it were fixed, and all the energy due to the sound-waves or the sound-record is communicated directly from the diaphragm to the recording-point or from the reproducing-point to the diaphragm, while the movements given to such points by eccentricities of the phonogram, being long and slow, overcome the tendency to inaction of the retarding device, and so permit the movement independent of the diaphragm. This makes it possible to record on or reproduce from a very irregular revolving phonogram—even one which is oval in shape.

In carrying my invention into effect I support the recording or reproducing point pivotally, and I attach to such point a retarding device, which is preferably a fan or piston, the inertia and retardation of which retard-

ing device are such that it will not be moved by the sound-vibrations, but will be moved by the slower movements referred to, so that the latter are not communicated to the diaphragm; but under the quick sound-vibrations the connection of the reproducing-point to the diaphragm is practically a rigid one. Instead of a fan I may employ a weight, preferably in the form of a wheel; but the fan or piston is found to be preferable.

My invention is illustrated in the accompanying drawings.

Figures 1 to 6 illustrate reproducers. Fig. 1 is a cross-section of the ear-piece and side view of the reproducing-point and the devices connected therewith; Fig. 2, a top view of the reproducing-point and the retarding device; Fig. 3, a perspective view of the same. Fig. 4 shows a modified arrangement of the retarding device; Fig. 5, a different mode of pivoting the reproducing-point; and Fig. 6 illustrates the use of a wheel as a retarding device. Figs. 7 and 8 show recorders. Fig. 7 is a cross-section of the mouth-piece and side view of the recording-point and retarding device, and Fig. 8 shows in section another form of retarding device.

Referring first to Figs. 1 to 6, A represents the diaphragm, and B a portion of the surface of the cylinder containing the sound-record. A small cork, *a*, is attached to the center of the diaphragm, and from the cork project small lugs *b*, on which the reproducing-point *c* is pivoted. Lugs *b* extend from a plate which is secured to the end of the cork *a* by suitable cement—such as melted shellac—and the cork itself is similarly cemented to the diaphragm. A fine spring, *d*, is cemented in a slit in the cork and bears upon the reproducing-point, so as to hold the same against the phonogram. The arm which terminates in the reproducing-point extends back past the pivot, and has soldered to it at *e* two prongs of thin metal, *f*, to which is attached a piece of thin mica, *g*, which preferably has side ribs, so as to form a trough. This forms a fan or vane, and I have found that such a retarding device is practically rigid under the minute vibrations due to the sound-record, so that such vibrations are communicated directly through the cork *a* to the diaphragm; but when the reproducing-point passes over

any serious irregularity in the surface, such as would injure the reproduction of sound, the slow movement thus produced overcomes the inertia of the fan, and the reproducing-lever rocks on its pivot, being kept pressed against the surface by the spring, so that such an irregularity is taken up by the reproducing-arm itself and does not communicate motion to the diaphragm. The pressure of the spring is very light and merely counterbalances the weight of the fan, so as to overcome any tendency of the point to leave the surface. It will be seen that I connect the spring with the diaphragm. I do this to prevent any loss of motion through the spring. If it were connected to the rim, any movement or energy which might be communicated to it would pass to the rim and be lost; but where the spring is joined to the diaphragm any motion communicated to it is given to the diaphragm and aids the amplitude of vibration.

In the form shown in Fig. 4 I inclose the fan in a chamber, *h*, secured to the arm of the diaphragm, so as to increase the resistance to the motion of the fan.

In Fig. 5 the reproducing-lever is pivoted at its outer end to the cork on the diaphragm, and the spring projects from said cork and lies upon said lever.

In the form shown in Fig. 6 a small wheel, *i*, is supported in bearings below the rim of the diaphragm, and a link-connection is made at *k* between the reproducing-lever and the shaft of said wheel. In this case the weight of the wheel retards the movement of the lever on its pivot under the sound-vibrations in the same way as the fan in the other form; but under the slow motions of the irregularities in the cylinder the weight of the wheel is overcome, so that it turns and allows the lever to rock on its pivot. Any of these forms may be readily applied to recorders.

Fig. 7 shows an arrangement precisely like that of Fig. 5, *r* being the recording-point.

Fig. 8 shows a different arrangement, which is also applicable to reproducers. A small hollow cylinder or dash-pot, *s*, is attached to the center of the diaphragm, and in this works a plunger or piston, *t*, attached to lever *u*, which carries the recording-point *r*. The lever *u* is pivoted below the rim of the mouth-piece, and the fine spring attached at the center of the diaphragm bears at the free end of said lever. The rapid and minute sound-vibrations do not move the dash-pot upon the piston, (or vice versa in a reproducer;) but slow movements due to irregularities move the piston and so cause the desired movement of the point independent of the diaphragm.

It will be seen that in all these instances a retarding device is used whose inertia is such as will not be overcome by the normal quick motion of the recording or reproducing point, but will permit it to move under the slower motions due to defects in the cylinder-surface.

What I claim is—

1. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the movement of the diaphragm, substantially as set forth.

2. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected with said diaphragm and capable of movement independent thereof, and provided with a retarding device for controlling such independent movement, substantially as set forth.

3. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, so as to have a movement independent thereof, and provided with a retarding device controlling such movement, substantially as set forth.

4. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the diaphragm, and a spring for holding said point against the sound-record, substantially as set forth.

5. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the diaphragm, and a spring connected with said diaphragm for holding said point against the sound-record, substantially as set forth.

6. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, a spring for holding said point against the sound-record, and a retarding device for controlling the movement of said point on its pivot, substantially as set forth.

7. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, a spring connected with the diaphragm for holding said point against the sound-record, and a retarding device for controlling the movement of said point on its pivot, substantially as set forth.

8. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted upon said diaphragm so as to have a movement independent thereof, and carrying the recording or reproducing point, and a retarding device connected with said lever, substantially as set forth.

9. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted thereto and carrying the recording or reproducing point, and a fan attached to said lever, substantially as set forth.

10. In a recorder or reproducer for phonographs, the combination, with the diaphragm,

of the recording or reproducing point connected with said diaphragm and capable of movement independent thereof, and a fan or equivalent device for retarding such movement, substantially as set forth.

5 11. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted thereto and carrying the recording or reproducing point, a fan attached

to said lever, and a spring for holding said point against the sound-record, substantially as set forth.

This specification signed and witnessed this 19th day of September, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.